

Allister Liu

Professor Hakner

ECE-357

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**PS1-P3**

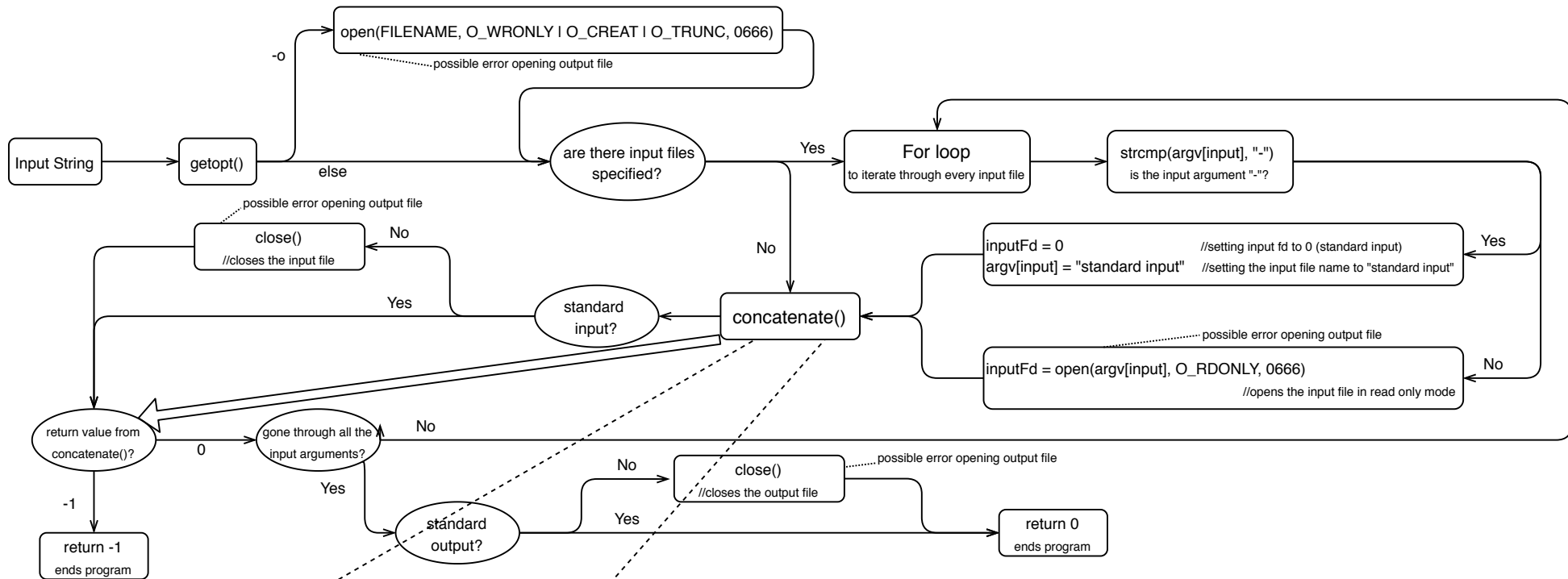
**Explanation of the program:**

SEE

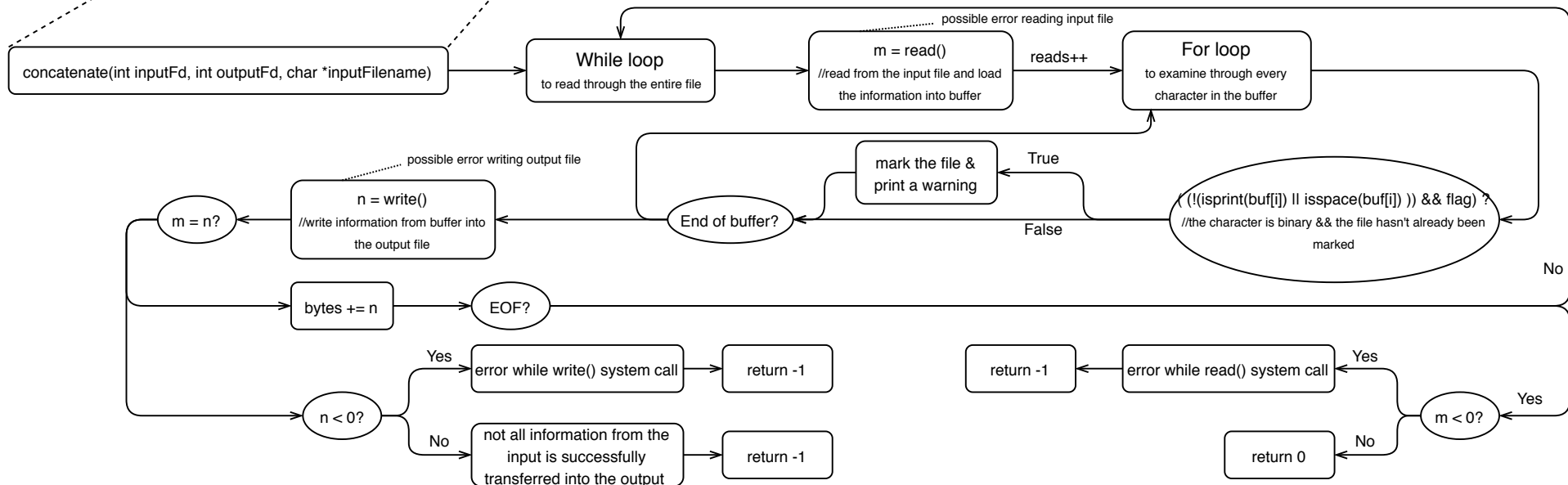
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int main(int argc, char \*argv[])



int concatenate(int inputFd, int outputFd, char \*inputFilename)



Test files:	short.txt	a text file under 4K
	long.txt	a text file over 4K
	short_binary.txt	a text file under 4K containing binary information
	long_binary.txt	a text file over 4K containing binary information

Test cases:

### 1. Concatenating two regular files (short.txt and long.txt).

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output1.txt short.txt long.txt

502 bytes are transferred from short.txt to the output file.
1 read system calls and 1 write system calls are made.

9838 bytes are transferred from long.txt to the output file.
3 read system calls and 3 write system calls are made.

A total of 10340 bytes are transferred to the output file.
A total of 4 read system calls and 4 write system calls are made.
Allisters-MacBook-Pro:test allisterliu$ echo $?
0
```

Our program reads the input files and writes the information to the output file – if the output file does not yet exist, the program will create it – and returns 0 as exit status.

### 2. Concatenating files containing binary elements (long.txt and short\_binary.txt).

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output2.txt long.txt short_binary.txt

9838 bytes are transferred from long.txt to the output file.
3 read system calls and 3 write system calls are made.
WARNING: The file 'short_binary.txt' is observed to be a binary file or had binary elements in it!

350 bytes are transferred from short_binary.txt to the output file.
1 read system calls and 1 write system calls are made.
A total of 10188 bytes are transferred to the output file.
A total of 4 read system calls and 4 write system calls are made.
Allisters-MacBook-Pro:test allisterliu$ echo $?
0
```

When concatenating files containing binary elements, our program will print a warning regarding the binary file.

### 3. Concatenating multiple files (long.txt, short.txt long\_binary.txt, short\_binary.txt).

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output5.txt short.txt long.txt long_binary.txt short_binary.txt
```

502 bytes are transferred from short.txt to the output file.

1 read system calls and 1 write system calls are made.

9838 bytes are transferred from long.txt to the output file.

3 read system calls and 3 write system calls are made.

**WARNING: The file 'long\_binary.txt' is observed to be a binary file or had binary elements in it!**

5095 bytes are transferred from long\_binary.txt to the output file.

2 read system calls and 2 write system calls are made.

**WARNING: The file 'short\_binary.txt' is observed to be a binary file or had binary elements in it!**

350 bytes are transferred from short\_binary.txt to the output file.

1 read system calls and 1 write system calls are made.

A total of 15785 bytes are transferred to the output file.

A total of 7 read system calls and 7 write system calls are made.

```
Allisters-MacBook-Pro:test allisterliu$ echo $?
```

```
0
```

Our program is able to concatenate multiple files at once.

### 4. Concatenating the same file multiple times (long\_binary.txt once and short.txt three times).

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output6.txt long_binary.txt short.txt short.txt short.txt
```

**WARNING: The file 'long\_binary.txt' is observed to be a binary file or had binary elements in it!**

5095 bytes are transferred from long\_binary.txt to the output file.

2 read system calls and 2 write system calls are made.

502 bytes are transferred from short.txt to the output file.

1 read system calls and 1 write system calls are made.

502 bytes are transferred from short.txt to the output file.

1 read system calls and 1 write system calls are made.

502 bytes are transferred from short.txt to the output file.

1 read system calls and 1 write system calls are made.

A total of 6601 bytes are transferred to the output file.

A total of 5 read system calls and 5 write system calls are made.

```
Allisters-MacBook-Pro:test allisterliu$ echo $?
```

```
0
```

Our program is able to concatenate the same file multiple times at once.

## 5. Not specifying output file.

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out short_binary.txt long.txt
```

```
WARNING: The file 'short_binary.txt' is observed to be a binary file or had binary elements in it!
```

操作系统(Operating System, 简称 OS)是管理计算机硬件与软件资源的计算机程序。操作系统需要处理如管理与配置内存、决定系统资源供需的优先次序、控制输入设备与输出设备、操作网络与管理文件系统等基本事务。操作系统也提供一个让用户与系统交互的操作界面。

```
350 bytes are transferred from short_binary.txt to the output file.
```

```
1 read system calls and 1 write system calls are made.
```

```
//
```

```
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//
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```

```
.
```

```
. the file is too long to display
```

```
.
```

```
    ** This contains the value of the Virtual Function Table Pointer
```

```
    */
```

```
    static void * VTable;
```

```
};
```

```
#endif
```

```
9838 bytes are transferred from long.txt to the output file.
```

```
3 read system calls and 3 write system calls are made.
```

```
A total of 10188 bytes are transferred to the output file.
```

```
A total of 4 read system calls and 4 write system calls are made.
```

```
Allisters-MacBook-Pro:test allisterliu$ echo $?
```

```
0
```

When user does not specify the output location, the program will output the information into standard output.

## 6. Using “-” as input.

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output9.txt long.txt -
```

**9838 bytes are transferred from long.txt to the output file.**

**3 read system calls and 3 write system calls are made.**

testing standard input

^D

**23 bytes are transferred from standard input to the output file.**

**1 read system calls and 1 write system calls are made.**

A total of 9861 bytes are transferred to the output file.

A total of 4 read system calls and 4 write system calls are made.

Allisters-MacBook-Pro:test allisterliu\$ echo \$?

0

If hyphen “-” appears to be one of the input arguments to this program – when the input file is not specified – the program will then concatenate standard input to the output, reading until end-of-file.

We notice that there are 22 characters (including space) input into the standard input, but there are 23 bytes transferred into the output; this is because of the new line character that user entered at the end.

## 7. Multiple hyphens.

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output11.txt - short.txt -
```

oh! you can use the hyphen more than once

^D

**42 bytes are transferred from standard input to the output file.**

**1 read system calls and 1 write system calls are made.**

**502 bytes are transferred from short.txt to the output file.**

**1 read system calls and 1 write system calls are made.**

isn't that amazing

^D

**19 bytes are transferred from standard input to the output file.**

**1 read system calls and 1 write system calls are made.**

A total of 563 bytes are transferred to the output file.

A total of 3 read system calls and 3 write system calls are made.

Allisters-MacBook-Pro:test allisterliu\$ echo \$?

0

The hyphen can be specified multiple times in the argument list, each of which will cause standard input to be read again at the point.

## 8. Not specifying input files.

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output13.txt
oh now we don't bother to pass in input files?
^D
47 bytes are transferred from standard input to the output file.
1 read system calls and 1 write system calls are made.
A total of 47 bytes are transferred to the output file.
A total of 1 read system calls and 1 write system calls are made.
Allisters-MacBook-Pro:test allisterliu$ echo $?
0
```

If no input files are specified, our program will read from standard input until EOF.

## 9. Specifying neither input files nor output file.

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out
and not even specifying output files?
and not even specifying output files?
^D
38 bytes are transferred from standard input to the output file.
1 read system calls and 1 write system calls are made.
A total of 38 bytes are transferred to the output file.
A total of 1 read system calls and 1 write system calls are made.
Allisters-MacBook-Pro:test allisterliu$ echo $?
0
```

If no input files and no output file are specified, our program will read from standard input until EOF, and write to the standard output.

## 10. Invalid input file name.

```
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output16.txt short.txt someRandomFilename.txt

502 bytes are transferred from short.txt to the output file.
1 read system calls and 1 write system calls are made.
ERROR: No such file or directory when opening someRandomFilename.txt.
Allisters-MacBook-Pro:test allisterliu$ echo $?
255
```

If an invalid input file name is encountered, an error message will be printed, and the program will be terminated, returning -1 as exit status.

## 11. Output file already exists.

```
Allisters-MacBook-Pro:test allisterliu$ touch output17.txt output18.txt
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output17.txt short.txt
```

**502 bytes are transferred from short.txt to the output file.**

**1 read system calls and 1 write system calls are made.**

A total of 502 bytes are transferred to the output file.

A total of 1 read system calls and 1 write system calls are made.

```
Allisters-MacBook-Pro:test allisterliu$ echo $?
```

```
0
```

If the output file specified already exists, the program will overwrite the original file.

## 12. No file access permission.

```
Allisters-MacBook-Pro:test allisterliu$ chmod 400 output18.txt
Allisters-MacBook-Pro:test allisterliu$ ./Concatenate.out -o output18.txt long.txt
```

**ERROR: Permission denied when opening output18.txt.**

```
Allisters-MacBook-Pro:test allisterliu$ echo $?
```

```
255
```

If the user doesn't have access permission to the desired file, the program will print an error message (permission denied), terminates itself, and returns -1 as exit status.